**Achievement objectives: Earth and space science 2012**

**Earth and space science is about the interconnecting systems and processes of the Earth, the other parts of the solar system, and the universe beyond.**

*The New Zealand Curriculum* specifies three sets of achievement objectives for Earth and space science:

* Earth systems
* Interacting systems
* Astronomical systems

The curriculum also specifies four sets of achievement objectives for the Nature of Science strand:

* Understanding about science
* Investigating in science
* Communicating in science
* Participating and contributing

The focus of the contextual strands is the ideas *of*science; the focus of the Nature of Science strand is ideas *about*science. Scientific literacy is developed through learning in both kinds of ideas.

**Progression in Earth and space science**

Students demonstrate progress in ESS by their increasingly sophisticated ability to identify, understand, integrate, and reflect on the interconnected, dynamic spheres and cycles of the Earth and astronomical systems.

As they progress, students:

* shift their focus from the separate parts and processes of Earth and space systems to the interdependence of those parts and processes
* move from knowing about the external and internal sources of Earth’s heat energy to understanding how heat energy from the sun and the centre of the Earth drives important earth cycles and processes; similarly, they move from knowing about different aspects of the cycling of matter to understanding how those aspects work together to create the cycles
* shift their focus from the surface geology of selected parts of New Zealand to understanding geological change over time
* move from knowing about the components of the solar system and the life cycles of stars to understanding the giant cycles of star and planet formation and the creation of new matter
* move from using familiar investigative methods to developing understanding of concepts such as density or heat transfer, to including unfamiliar investigative methods such as modeling and satellite images, to applying such concepts to the understanding of Earth and space system processes
* move from recognising the existence of time and distance scales to developing the understanding that, in Earth and space systems, events and processes can happen on time scales that range from micro-seconds to billions of years, and on distance scales that range from microns to light years
* shift their focus from understanding that human existence depends on Earth’s processes and resources to understanding that human activities are depleting resources and unbalancing the cycles of the Earth system, with significant consequences for all parts of the Earth system, but particularly the biosphere, with potentially irreversible effects such as extinction.

**Indicators**

Indicators are examples of the behaviours and capabilities that a teacher might expect to observe in a student who is achieving at the appropriate level. Teachers may wish to add further examples of their own.

**Context elaborations**

Context elaborations are possible contexts for learning, with a suggestion of how they might be used with the focus achievement objective.

The listed context elaborations are examples only. Teachers can select and use entirely different contexts in response to local situation, community relevance, and students’ interests and needs.

**NCEA: What has changed?**

* The achievement standards have been designed to align with the NZC, and reflect the change in direction for science education. Most existing programmes will need to be reshaped to meet the achievement aims for science, and in particular the Nature of Science.
* The Nature of Science aims and objectives have been embedded and integrated into all standards.
* The explanatory notes for each standard indicate which science achievement objectives are the focus.
* Key terms such as *investigate, demonstrate understanding* and *justify* are fully explained in the explanatory notes.
* The additional information/teacher guideline sections of exemplar resources (internal tasks) provide further guidance around how the Nature of Science is involved, for example, Science 1.6A.
* See assessment for qualifications section for each achievement objective. This suggests possible assessment activities related to each particular achievement objective.

[TOP](http://seniorsecondary.tki.org.nz/Science/Achievement-aims/AOs-by-strand/AOs-Earth-and-space-science#wrapper)

**Achievement objectives**

Students will:

**Level 6**

**Earth systems**

* [PEB 6-1](http://seniorsecondary.tki.org.nz/Science/Achievement-aims/AOs-by-strand/AOs-Earth-and-space-science/AO-PEB-6-1) Investigate the external and internal processes that shape and change the surface features of New Zealand.

**Interacting systems**

* [PEB 6-2](http://seniorsecondary.tki.org.nz/Science/Achievement-aims/AOs-by-strand/AOs-Earth-and-space-science/AO-PEB-6-2) Develop an understanding of how the geosphere, hydrosphere, atmosphere, and biosphere interact to cycle carbon around Earth.

**Astronomical systems**

* [PEB 6-3](http://seniorsecondary.tki.org.nz/Science/Achievement-aims/AOs-by-strand/AOs-Earth-and-space-science/AO-PEB-6-3) Investigate the interactions between the solar, lunar, and Earth cycles and the effect of these on Earth.

**Level 7**

**Earth systems and interacting systems**

* [PEB 7-1 and 7-2](http://seniorsecondary.tki.org.nz/Science/Achievement-aims/AOs-by-strand/AOs-Earth-and-space-science/AOs-PEB-7-1-and-7-2) Develop an understanding of the causes of natural hazards and their interactions with human activity on Earth.

**Astronomical systems**

* [PEB 7-3](http://seniorsecondary.tki.org.nz/Science/Achievement-aims/AOs-by-strand/AOs-Earth-and-space-science/AO-PEB-7-3) Explain the nature and life cycles of different types of stars in terms of energy changes and time.

**Level 8**

**Earth systems and interacting systems**

* [PEB 8-1 and 8-2](http://seniorsecondary.tki.org.nz/Science/Achievement-aims/AOs-by-strand/AOs-Earth-and-space-science/AOs-PEB-8-1-and-8-2) Develop an in-depth understanding of the interrelationship between human activities and the geosphere, hydrosphere, atmosphere, and biosphere over time.

**Astronomical systems**

* [PEB 8-3](http://seniorsecondary.tki.org.nz/Science/Achievement-aims/AOs-by-strand/AOs-Earth-and-space-science/AO-PEB-8-3) Explore recent astronomical events or discoveries, showing understanding of the concepts of distance and time.